



ORIGINAL RESEARCH PAPER

Nursing

THE EFFECT OF COLD APPLICATION ON PAIN DUE TO CHEST TUBE REMOVAL

KEY WORDS: Cardiothoracic Surgery, Chest Tubes Removal, Cold Application, Pain Intensity.

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ABSTRACT

Chest tubes removal after cardiothoracic surgery has been described as one of the worst experiences among these patients.

Aim: The study aimed to examine the effect of cold application on pain intensity during chest tube removal.

Material and method: A quasi experimental design (study - control) was used in this study. This study was conducted in the cardiothoracic surgical department and intensive care unit at Pécsi Tudományegyetem Klinikai Központ Szívgyógyászati Klinika, Pécs, Hungary. A convenient sample of 100 patients hospitalized in the cardiothoracic surgical department and Intensive Care Unit. The study group received ice therapy before Chest tubes removal, whereas control group without cold application. One tool was used it covered two parts: 1. Demographic information and 2. Visual Analogue Scale to measure pain intensity during chest tube removal.

Results: The study noted that there was a statistically significant difference between study and control group regarding pain intensity post intervention.

Conclusion: The results concluded that, the application of ice pack during Chest tubes removal appears to have a remarkable effect on pain intensity. Thus it can be used the ice application can be used as a non-pharmacological intervention as it provides a safe and effective reduction in pain without side effects.

Recommendations: To develop In-service training programs for nurses in Intensive Care Units about the utilization of non-pharmacological.

INTRODUCTION:

Placement chest tubes (CT) following coronary artery bypass graft (CABG), valve replacement or repair, or repair of structural defects plans to encourage drainage of air, blood, and fluid from the pleural, pericardial or mediastinal cavity (13, 27). Chest tube inclusion, is related with expanded pain and distress for the patient, mechanical irritation of the heart and pericardium, and an expanded occurrence of contamination (23). Numerous cardiothoracic patients indicate an insertion of a chest tube, in either emergency or nonemergency circumstance with ultimate removal (4). These chest tubes are inserted during the postoperative period (5). By placing these tubes many heart and lung complications can be avoided. Every chest tube ought to be regularly evaluated assess the tube function, and record how much drainage is originating from tube on the particular sheet (6).

Chest tubes are removed on the second or third postoperative day. Patients portray chest tube evacuation as an agonizing and distressful occasion in their postoperative recovery. Some patients describe it as the worst event during their hospital stay (23). The pain is caused by harmed intercostal nerves at the entry point site, irritation and incitation of pleura during catheter placement and removal (10).

Pain in general, is defined by the International Association for the Study of Pain (IASP) as "an unpleasant sensory and emotional experience resulting from actual or potential tissue damage". Recent literature has emphasized the importance of pain and recommended it as the fifth vital sign. Pain management is one of the essential needs of people and has primary priority in practices of nursing care (7). Several integral and elective prescription treatments that nurses can apply autonomously are utilized to decrease pain and anxiety (16, 20). However, removing the tube causes pain. Considering that nurses are in direct and continuous contact with patients, they should assume an important role in assisting the patients to accept the drug-free treatments such as complementary and alternative medicine (19).

There is evidence that application of cold can control pain, and increase the threshold of pain (13). Likewise several clinical trials recommended that the utilization of cold application can be a potential solution for the pain management during chest tube removal as it has been demonstrated that the application of cold is effective for pain relieving during chest tube removal than other narcotics (11, 9). Cold therapy is an ancient method of pain control, which is remarkably influential in relieving inflammation, treatment of soft-tissue injuries, and wound healing. This simple

approach has been applied since the time of Hippocrates to reduce the effects of trauma. The cooling effect of localized cryotherapy on surface and intramuscular tissues leads to physiological changes and reduces metabolism, muscle cramps, inflammation, and pain perception (12, 17).

The mechanisms of pain relieve with cold application including inhibition of nociceptors, a reduction in muscle spasm and/or via the analgesic descending pathway of the central nervous system such as endorphins. Other relevant literatures pointed to the significant role of the cold application reduce pain through excretion of endorphin; inhibit diffusion of harmful materials and reducing pain receptors sensitivity (8). Moreover, this technique diminishes the sensory and motor nerves conduction velocity, cellular metabolism, tissue hypoxia and edema (11). A couple of studies have analyzed the impact of cold therapy on CTR pain that mostly have yielded conflicting outcomes. A few examinations have demonstrated a decrease in peripheral blood flow caused by different techniques of application of cold. The reasons put forward to clarify this decline in blood flow are vasoconstriction caused by the sympathetic nervous system reflex and the affinity caused by the cold of the postjunctional alpha-2 receptors of the vessel walls (18).

In pain management, important evidence will be acquired once change from dependent roles to independent roles with spreading of non-pharmacologic methods within nursing practices. The critical care nurse plays an important role for pain management during chest tube removal utilizing non-pharmacological pain-relieving methods for example cold application rather than administration of analgesic or pain-relieving drugs such as opioids and Non-Steroidal Anti Inflammatory Drugs which is the most common intervention used for pain management during chest tube removal.

Aim of the Research:

The present research was conducted to examine the effect of cold application on pain intensity during chest tube removal

The Hypothesis of the Research:

Patients with cold application can have considerably less pain intensity related to CTR than those in the control group

MATERIALS AND METHODS

Design

A semi experimental design (study - control) was used.

Setting

The current study was conducted at the Cardiothoracic Surgical Department and Intensive Care Unit at Pécsi Tudományegyetem Klinikai Központ Szívgyógyászati Klinika, Pecs, Hungary. Between November 2017–July 2018.

Sample

A convenient sample of 100 patients hospitalized in the Cardiothoracic Surgical Department and Intensive Care Unit (ICU) and who had chest tubes for duration at least 24 hours after cardiac-thoracic surgery. Patients were assigned to two groups Study group Applied cold application with soft ice pack gel which comprised 50 patients, Control group without application with ice bag which comprised 50 patients

Inclusive criteria:

- 18 years old or older.
- Patients with normal vital signs.
- Able to report pain.
- 6 hours after the last painkiller administration, for experimental group.
- Have one or two mediastinal, pericardial or pleural tubes.

Exclusive criteria:

- Mechanical ventilation support.
- Communication problems.
- Psychiatric disorder / Mental disabilities or with communication problems.

Tools of Data Collection

First Part: Demographic information was collected from the patients' medical records regarding: gender, age, surgical procedure, and length of surgery, type of chest tube, number of days indication of chest tube insertion, skin temperature, heart rate, systolic, and diastolic blood pressure.

Second Part: The Visual Analogue Scale is an instrument used to measure the intensity of pain.

METHODS:

The study group:

- The researcher measured the patients' vital signs and asked the patients to mark the pain they feel with the chest tube in place on the VAS and measured the skin temperature of the area where the ice was applied (**1st measurement**).
- The researcher placed a single layer of sterile gauze pad around the area of insertion to skin of the chest tubes and placed an ice pack on top of them. The researcher kept the patient in the same position throughout the ice application and stayed with the patient to prevent the slippage of ice pack from its place.
- The researcher terminated the ice application when the skin temperature reached 13 °C and give the patient the VAS one more time asking him/her to mark the pain. It took average nine minutes for the skin to reach 13 °C (**2nd measurement**).
- Immediately after the CTR by the physicians, the researcher measured the skin temperature of the areas and asked the patient to mark the pain he/she felt during the removal of the chest tube on the VAS (**3rd measurement**).
- Five to Ten minutes after the CTR, researcher measured the skin temperature of the patient for the last time and recorded both the pain measurements as well as the skin temperatures which terminate the application (**4th measurement**).

The Control Group

- The control group received Analgesics before two hours of chest tube removal.
- The researcher measured the patients' vital signs and asked the patients to mark the pain they feel with the chest tube in place on the VAS and measured the skin temperature of the area around the chest tube (**1st measurement**).
- Immediately after the CTR by the physicians, the researcher measured the skin temperature of the areas and asked the patient to mark the pain he/she felt during the removal of the chest tube on the VAS (**2nd measurement**).

- Five to Ten minutes after the CTR, researcher measured the skin temperature of the patient for the last time and recorded both the pain measurements as well as the skin temperatures (**3rd measurement**).

Data Analysis

In the statistical analysis, for the descriptive analysis, the categorical data were arranged in tables of absolute and relative frequencies. Data with normal distributions were presented as the mean and standard deviation. The Unpaired "t" was used to compare the means of continuous independent variables relative to the groups. In all of the analyses, standard 0.05 p-values and 95% confidence intervals were applied.

RESULT:

Table (1) illustrates that one hundred chest tubes were inserted to patients in study group and control group (Study Group: 50 patients using ice pack during chest tube removal, while Control Group: 50 patients without using ice-pack during chest tube removal). This table shows that (30.0%) of patients were female and (70.0%) were male in study group. In control group (84.0%) were male and (16.0%) were female. The mean age was 65.4±7.1 years old in study group and 60.4±7.3 years old in control group. It can be seen that the mean duration of chest tube was 25.6±5.8 hours in study group and 27.8±9.9 hours in control group.

Table 1: Socio- Demographic Characteristics of the control and Studied Groups

Characteristics	Study Group (n=50)		Control Group (n=50)	
	No	%	No	%
Gender				
Male	42	84.0	35	70.0
Female	8	16.0	15	30.0
Age (in years)				
Mean ±SD	60.4±7.9		62.4±7.1	
Type of Chest Tubes				
Mediastinal&Pericardial	24	48.0	45	90.0
Mediastinal, Pericardial or Pleural	26	52.0	5	10.0

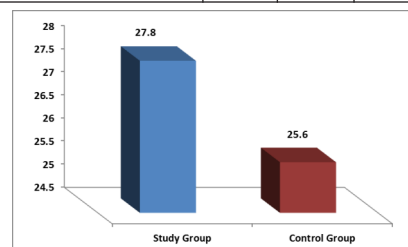


Figure (1): Duration of Chest Tube Insertion/Hours

Table (2) illustrates the pain intensity between the two groups before, immediately after, and 5-10 min after removal. The means of pain intensity scores before chest tube removal were 2.4 ±2.8 for study group, while 2.6 ±2.1 for control group, pain intensity was insignificantly different between the two groups before intervention (P > 0.05). The means of pain intensity scores immediately after removal were 2.3±2.2 for study group, while 7.4±2.0 for control group, pain intensity was significantly different between the two groups immediately after removal (P < 0.01). The means of pain intensity scores after 5-10 min removal were 0.1±0.4 for study group, while 1.1±1.3.0 for control group, pain intensity was significantly different between the two groups 5-10 min after removal (P < 0.01).

Table 2: Pain Intensity Scores over Time

Pain Intensity	Study group		Control group		t	P
	Mean	±SD	Mean	±SD		
Pain (Immediately before Removal)	2.4	2.8	2.6	2.1	0.40	0.69

Pain(Immediately after Removal)	2.3	2.2	7.4	2.0	12.12	0.0001
Pain (5-10 min after Removal)	0.1	0.4	3.2	1.3	16.12	0.0001

Significant level at P < 0.05

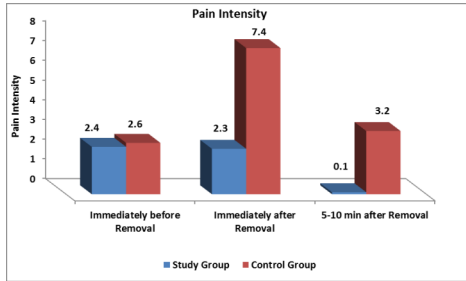


Figure (2): Pain Intensity Visual Analog Scale (VAS)

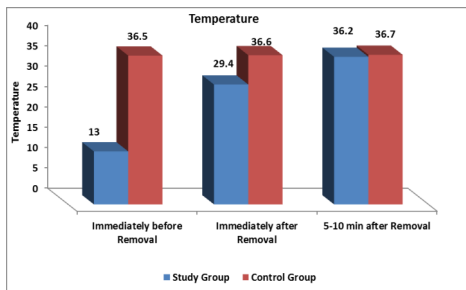


Figure (3): Temperature over Time(Celsius)

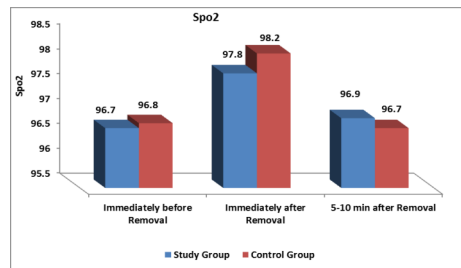


Figure (4): SPO2 over Time(%)

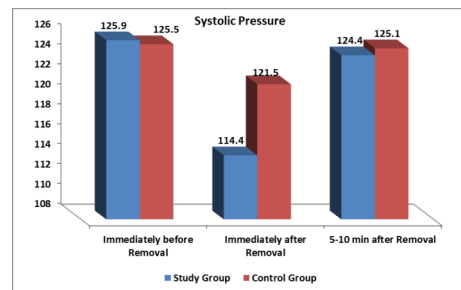


Figure (5): Systolic Pressure over Time(mmhg)

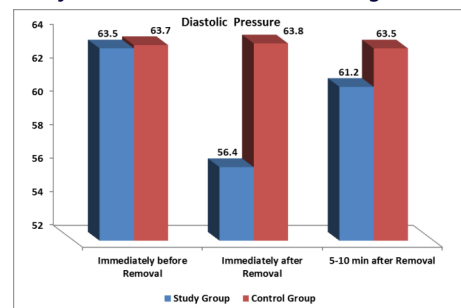


Figure (6): Diastolic Pressure over Time(mmhg)

DISCUSSION

The administration of pain is think about the principle worry for all hospitalized patients, numerous exertion was done to enhance

the competency of the administration of pain, hopefully we will decrease pain from the begin (8). The CTR causes pain for parietal pleura, pectoral muscle and other type of fibers, including intercostal nerve fibers (14).

In the present investigation, it was observed that the visual analogue score gotten immediately before chest tube removal were mild in study group and was higher than other score obtained for other time points in control group. The VAS scores got immediately after chest tube removal were moderate in control group, while it was mild in study group. The VAS scores got 5-10 minutes after CTR in cold application group produced the most enhancement in pain and was the most effective in relieving the pain association with CTR. The findings of the current study were in agreement with (13) conducted a controlled clinical trial, to survey impact of cold application on pain because of chest tube removal. Cold was applied to the study group and the skin temperature and pain intensity was measured 4 times; prior to the application of cold, before removing chest tube, not long after the removal of chest tube, five minutes after the removal of the chest tube. The visual analogue scale score was measured immediately after the removal of the tube in the experimental group was 3.8, compared with 5.6 in the control group. There was significant difference in pain. between the two groups. Similar study conducted by (1) who agreed with our examination who speaks to correlation between control and study groups as regards to pain intensity measurement observed that the visual analogue score got immediately after chest tube removal were mild in study group and was higher than other score obtained for other time points in control group. The VAS scores obtained 15 minutes after CTR in cold application group produced the most enhancement in pain and was , effective in relieving the pain association with CTR. Also, perceived pain was the most intense during CTR (VAS 2) in control group. Also, the study of (11) found that cold application reduced patients' intensity of pain due to CTR. On contrast of the study done by (22) who expressed that the finding of his investigation don't support that pain intensity scores & pain distress scores were not significantly different between the patients who received ice and the one who received tap water. A 10 minutes use of ice brought about subcutaneous tissue cooling and absence of pain in a few investigations. The results of the current study incongruity with study conducted by (26) indicate that ice compression was ineffective in relieving the CTR pain. The inconsistency of our results with those of study may be due to some differences in the methodologies of the studies.

The findings of the present study examination uncovered that there is a statistically significant decrease in pain intensity at the two measurement points after chest tube removal in the studied group compared to the control group. The findings of the current study are similar to what was reported by (24) who found that, there is a statistically significant decrease in pain intensity at the three measurement points , in the studied groups (cold application group, breathing exercise group and cold application and breathing exercise combined group) compared to the control group. The findings of the current investigation are like to what was reported by (15, 21)whom examined the effect of cold application combined with a breathing exercises technique on pain intensity during chest tube removal and found that utilizing cold application joined with breathing exercises technique was effective in decreasing pain intensity. However, the study findings are different from what was reported by (24) who found that cold therapy was not very efficient in diminishing pain. The patients in the cold application group reported that pain intensity at 15 and 30 minutes after chest tube removal was like the control group. The study findings are different from what was reported by (25) who examined utilizing the cold bag and breathing technique to diminish anxiety level at 30 minutes after chest tube removal.

Limitation of the study:

- This study was conducted among a limited number of patients undergoing open heart surgery. Therefore, the findings cannot be generalized to other patients who experience CTR.
- In this study, patients might have responded differently to pain based on their physical condition, emotional and cultural states.

Recommendations

The study recommends the following for future research

1. The study can be conducted with a larger group in different setting for better generalization.
2. A comparative study can be done to assess the effectiveness of ice application with other non-pharmacological interventions.
3. Nurses and patients need to understand that non-pharmacological pain management
4. Incorporation of theoretical and practical non-pharmacological pain management methods in nursing Curricula.
5. In-service training programs for nurses in ICU about the utilization of non-pharmacological approaches

CONCLUSION

Based on the study findings, it could be concluded that the application of ice pack during CTR appears to have a remarkable effect on pain intensity. Thus it can be used as a non-pharmacological intervention as it provides a safe and effective reduction in pain without side effects.

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